



RAPTOR RESEARCH NEWS

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EDITORS' NOTES

The Editors' hopes to get this issue out in July were unfulfilled. Issue No. 2 which was issued in May should have been labeled April rather than May. The months of issue are January, April, July, and October. Hunter wishes to notify his correspondents that replies to their letters should be forthcoming after the moving of his office is complete.

The reader may note in the News a greater degree of subjective conjecture than is usual in a more formal journal. Although the Editors may not agree with some of the conjectures, they encourage them as a means of stimulus to the readers. If you have facts that contradict statements in the News, write them up and send them to us. Hopefully the comments will encourage and give direction to observations and experiments.

Subscriptions and Associate Memberships are on a calendar year basis. If anyone has failed to receive any of the preceding issues, please notify Don Hunter.

ADDITIONAL ADVISORY BOARD MEMBERS

We are happy to report that the following persons have agreed to serve on the Raptor Research Foundation Advisory Board.

Dr. Frank C. Craighead, Environmental Research Institute, Boiling Springs, Pennsylvania.

Dr. Joe T. Marshall, Jr., U.S. Army-SEATO Medical Research Laboratory, Kuala Lumpur, Malaysia.

Dr. Robert M. Stabler, Colorado College, Colorado Springs, Colorado.

BREEDING PROJECT INFORMATION EXCHANGE

The initiation of this exchange has been postponed to the first of September. The cooperators have been sent the necessary materials and directions.

EGGSHELL WEIGHTS IN RAPTOR

Of considerable interest in a recent paper by D. A. Ratcliffe of the Nature Conservancy in Great Britain: "Decrease in Eggshell Weight in Certain Birds of Prey" (Nature 215:208-210, July 8, 1967). A rather sudden decrease in eggshell weight of several raptors

occurred in 1946-50. He noted that for Peregrine, European Sparrowhawk, and Golden Eagle, "frequency of egg breakage, scale of decrease in eggshell weight, subsequent status of breeding population, and exposure to organic pesticides are correlated." He also presents further interesting information.

Joe Hickey, Department of Wildlife Ecology, University of Wisconsin, has initiated a similar investigation on this continent. In a letter he writes, "we currently are having D. W. Anderson visit various museum egg collections in order to get some standardized statistics on egg-shell weights prior to 1940. Dan started in the San Francisco area where he measured 3225 eggs in 940 clutches. He is currently in L.A., will work both coasts, and expects to concentrate on 20 species of raptorial and fish-eating birds. We do not expect this survey to encounter any appreciable numbers of sets collected after 1940 for the species of interest to us."

BREEDING PROJECTS

Last year we were happy to report that several projects had produced eggs, albeit infertile, with the exception of Ron Austing's Red-tails which produced not only fertile eggs but raised the young. The problem as related to the falcons, particularly the large species, seemed to be one of obtaining fertile eggs. This year, as reported in the April issue of Raptor Research News, fertile eggs had been obtained by an identical technique from a pair of Peregrines (Beebe) and a pair of Prairies (Kendall). We have since learned that Olendorff's American Kestrels laid eggs which hatched. We have then it seems gone quite a way toward solving the problem of obtaining fertile eggs. We regret however that we must report that all young died either shortly after hatching or within two weeks, as we have learned (unofficially) was the case with the American Kestrels. It appears that while we have taken a giant step forward, we still have much to learn about incubation and nutrition. Brief resumés of the above projects and their outcome in 1967 are given below.

Beebe's Peregrines. As reported in the last issue, a second set of four eggs was laid after the infertile first set of four was taken from this pair of Peale's Peregrines. Three of these proved fertile, two hatched, and the third was fully developed but did not get out of the shell. Both of the live hatched young died within two days of hatching. The cause of death is not as yet known. Laboratory tests are being made and the exact cause of death may yet be determined. It is suspected that parental diet or low humidity or a combination of both may be the cause. There appeared to be some difficulty experienced by the chicks in getting out of the egg. We hope to have a more extended report in the next issue.

Henry Kendall's Prairie Falcons. The pair of Prairie Falcons was subjected to the same management procedure as were the Beebe Peregrines. Here too the first set of eggs was infertile, the second, fertile. Young were hatched but were apparently killed by the parent birds. There was one variant in this project in that

day old cockerel chicks were fed to the parent birds, which may have been a contributing factor in the unfortunate behavior. We are not in receipt of a detailed report on this project.

Olendorff's American Kestrels. This project involves a pair of kestrels that was unsuccessful last year in producing fertile eggs but this year hatched young which lived for two weeks before expiring.

(Summary by Don Hunter)

RAPTOR POPULATIONS

South Dakota Population Survey. An appraisal of the data so far received indicates that there was a substantial loss of nests in the western part of the state due to late spring storms, particularly as concerns ground nesting hawks, e.g., Marsh Hawks and Ferruginous Hawks. There was some loss also apparent in tree nesters due to the same cause. It appears that most of the nesting territories were again occupied so that no decline in breeding population is evident in the areas studied.

Red-tails had another good year in eastern South Dakota, but with some loss of nesting trees due to human destruction. Prairie Falcons had less success than last year with an average of less than four per eyrie. An unusual amount of rain made access to several eyries next to impossible. At one eyrie five large downy young were found shot and the adults nowhere in evidence. These too were presumably shot. Golden Eagles also had fair success. We are checking a report of one eyrie with three young.

John Flavin reports a rather severe loss of Ferruginous nests in his banding area, presumably due to the late storm. Also, and this is of concern to us, he reports that of the three Richardson's Merlin (Pigeon Hawk) nests he found, NONE raised any young. We have unconfirmed reports that this little falcon is rapidly disappearing from the area of former relative abundance in Saskatchewan. We think this warrants immediate attention and we would appreciate population observations, either nesting or migration counts, from any part of the range. (Summary prepared by Don Hunter.)

PRIVATE POWER COMPANY JOINS FIGHT TO SAVE THE BALD EAGLE

A private power company has joined the battle to save the national bird, Secretary of the Interior Stewart L. Udall said today. The Northern States Power Company of Minneapolis, Minn., has adopted rules to protect the American bald eagle on 30,000 acres along the St. Croix River in Minnesota and Wisconsin.

In a letter to Earl Ewald, president of the company, Secretary Udall wrote: "The people of the United States are indebted to you and to your company for adopting a policy which will give protection to nesting areas and migration routes of the bald eagle along the St. Croix River."

As its contribution toward efforts to save eagles, the company recently adopted a policy which states:

"The bald eagle, emblem of our nation, is in danger of becoming extinct. Northern States Power Company and its subsidiary, United Power and Land Company, have adopted a policy which will provide protection for the nesting areas and migration routes of this bird. Approximately 30 thousand acres of wilderness river land owned by Northern States Power Company and its subsidiary, United Power and Land Company, will be subject to the following rules and regulations . . ."

These include: showing all known nests and their buffer zones on maps used in management of the lands; limiting activities within 130 feet of any known active nest; establishing a 660-foot buffer zone around known active nest trees; saving old-growth pine trees in the buffer zones; prohibiting foot trails or other developments that would make nest sites more accessible to humans; providing special management consideration for areas which might be active nest areas, and exercising extra precaution in using insecticides near known nest sites and along waterways. (U.S. Department of Interior News Release.)

INDIAN RESERVATION IN MINNESOTA BECOMES EAGLE SANCTUARY

American Indians, who still prize eagle feathers for ceremonial status, are joining the fight to save the national bird from extinction. The Red Lake Band of the Chippewa Tribe has designated its 400,000-acre reservation in north-central Minnesota as a Bald Eagle Sanctuary.

The Chippewa lands are on an important eagle migration route and have several active nests. Rare except in Alaska, bald eagles are one of the species Secretary of the Interior Stewart L. Udall has designated for management and study under the Endangered Species Act of 1966.

The sanctuary will be dedicated May 12 in ceremonies that also signal the completion of a wildlife marsh restoration project on the reservation.

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And then, there'll be the eagle feathers. The Bureau of Sport Fisheries and Wildlife has a standing order from some Indian tribes for feathers of eagles that die in the sanctuary. Donation of the feathers is permissible as long as they are used only for ceremonial purposes. (U.S. Department of Interior News Release.)

Some Ideas Concerning the Breeding of Peregrines in Captivity

by

James Enderson

In view of the urgent need to increase the supply of Peregrines for falconry and because of a diminishing number of wild Peregrines, a practical means of causing Peregrines to produce young in captivity is of great importance. With only a few exceptions attempts to breed Peregrines have failed. In the following I have outlined a series of procedures that I am certain will go far in producing the desired end, i.e., the establishment of a self-sustaining domestic strain of Peregrine Falcons.

First some general comments. Peregrines in the wild are aggressive breeders. This means that the phenomena leading to the production of young are not passive operations but powerful behavioral and physiological reactions to environmental stimuli. The basis of these reactions is genetic; the series of events that results in the production of young is written on the genes of each living Peregrine. The role of the would-be Peregrine breeder is to allow that genetic information to be expressed.

The "simplest" way to do this is to provide exactly the series of conditions to which the bird's genetic information has become evolutionarily adjusted, in short, allow the bird to reproduce in the wild. In lieu of that, the breeder must provide an environment for the birds that is consistent with the genetic information that says "make new Peregrines." To do this one must have the keenest insight as to just precisely what a Peregrine is, in the biological sense.

In order to achieve this understanding the best place to start is at a point free of any suppositions regarding what Peregrines "would like" in the way of captive conditions. We must stop thinking along the lines of what would seem "desirable" to them, and instead provide conditions that will make reproduction an imperative, as it is in wild birds. This means that the fault is not with birds that do not breed, but with the conditions that obtain in their captivity.

How does one provide the conditions which will allow the genetic information of the species to do what it has done over a thousand thousand generations, making it an imperative to reproduce? Simply provide, so far as possible, the environmental situations with which that genetic information has come to terms.

Light. Change in photoperiod (length of day and night) is the trigger and the timer of the reproductive cycle of many vertebrates, especially birds. The breeder must provide light conditions to which the bird's genetic information has become evolutionarily adapted. Beebe's and Kendall's encouraging results may well be due to the fact that they are working with races of birds that would

normally reproduce under the natural light conditions in the region of their captivity. Fyfe has had little response from tundra Peregrines in New Brunswick. Under natural light, the annual photoperiod changes at New Brunswick are vastly unlike those to which tundra birds are adapted. Tundra birds winter in a near 12-hour photoperiod. In mid-April they fly into a near 24-hour photoperiod in two to three weeks or less. In short, arctic Peregrines are seldom exposed to less than 12 hour days and spend a good deal of time in continuous light. Further, the change from 12-hour days to continuous daylight as they race northward may well trigger the necessary hormonal changes.

The breeder should expose his birds to at least the same photoperiods that they would experience in the wild. At the critical time in the spring one might use extra long days as a lever to stimulate physiological development. Natural light may well be best. Incandescent bulbs of 40 watts (15 hr. photoperiod) will bring sparrow testes to full size in the fall, when the birds are kept in a four-foot square cage. Two 250 watt bulbs should stimulate changes in Peregrines in an eight by ten foot room. Someone should try a spring transition to a 24-hr. photoperiod in even Peale's Falcons or Prairie Falcons.

Breeding Quarters. To contain a Peregrine in a room is unnatural, but this cannot be overcome. At any rate, natural light should enter through large openings not covered with glass. Screened sections in the roof would be good, with some provision for covering these in severe winter weather only. In the wild, copulation is the result of mutual triggering by both birds. The approach of the male to the perch of the female causes her to crouch; this in turn releases mounting behavior on the part of the male. Perches should be available that allow plenty of head-room and "wing-room" for these activities. The nest ledge should be roomy; Peregrines in the wild almost always choose sites that are more roomy than those selected by the Prairies. A ledge at least three feet square may be none too big. Some sort of covered ledge, darkened at the rear, might provide added stimulus. A large drum, open at one end and mounted by its base might prove satisfactory with gravel or sod added. A bath should be present, perhaps with a trickle of running water.

Food. Peregrines eat a variety of prey in the wild and one cannot err in providing variety in captivity. Six-week-old chicks make a good and inexpensive food. Pigeons, beef heart, horse meat, and occasional road-killed animals are good too. Twenty pairs of white mice, set up in a colony can provide four to six mice a day at low cost. These mice, homogenized without skin or large intestine can provide an ideal food for very young eyasses. Whenever possible, the male Peregrine should be allowed to kill food animals provided. Every game-hawker knows that the process of killing prey has a noticeable effect on the behavior of the bird for several minutes after the kill. The person in charge creates an unnatural situation when he feeds the male; the female should feed herself or be fed by the male.

Other. All unnecessary disturbance should be kept to a minimum. I do not think that it is impossible to induce passage birds to breed if the quarters are large and disturbance small. A room with no windows, only large open roof sections might work best for both intermewed eyass and passage hawks. All perches should be padded with foam rubber and covered with rubberized nylon fabric. Several of us, including Stabler and Berthrong, feel strongly that captivity creates increased stress on the feet. Padded perches simply distribute the weight and prevent corns that are precursors of bumblefoot. In my opinion, no person who has inquired as to the nature of the perch used by birds with bumblefoot can objectively argue for the use of hard perches.

It seems to me that Raptor Research Foundation should quickly organize three or four operative units made up of people in different regions interested and capable of putting a great deal of time and effort into the project. Each unit might explore different alternatives to various problems. A catalog of the various adult birds now in captivity and available for pairing should be made, and a list of expected recruits drawn up. By December people in charge of the units should see to it that the facilities of their units are inhabited by pairs of Peregrines being kept under proper conditions. Raptor Research Foundation might set down certain guidelines for the operation, objectives, and responsibilities of each unit. The impetus for this action should come from the possibility that within a very few years these opportunities will be lost.

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A Preliminary Summary of a Peregrine and Prairie Falcon Survey in the Southern Interior of B. C.

by

R. Wayne Nelson

Since 1950, many populations of the Peregrine Falcon have shown dramatic reductions in breeding success and breeding distribution. Considerable evidence has been gathered in Europe, especially in Britain, concerning the relationships between the use of biocides and the disappearance of the Peregrine and the European Sparrowhawk. In North America, the Bald Eagle and Osprey of the eastern parts of the continent have been, and still are being studied in detail, and the effect of biocides is very strongly suspected as being the prime factor in the widespread declines in their numbers.

In eastern North America, the distribution of the Peregrine was surveyed by Hickey (1942), and a western survey was conducted by Bond (1946). Considerable numbers of breeding pairs were reported in both these articles. When considering B.C. Peregrines, Bond discussed the west coast Peale's subspecies but only briefly mentioned

that little was known of interior falcons. Enderson (1965) discussed the breeding numbers of Peregrines in the Rocky Mountain area from southern Colorado to central Alberta. The falcons in the B. C. interior have not been seriously studied.

During the spring and summer of 1966 a study was begun to attempt to determine the causes of the decline of the Peregrine and Prairie Falcons in the B. C. southern interior. The study was approached with several general aims:

1. to locate, map, photograph, measure, and otherwise study and record information from all the old and present eyries used by these species;
2. to obtain all possible information on these eyries, as concerns their histories, e.g. when and what disturbances appeared, when last occupied, what food species were and are utilized;
3. to obtain an over-all picture of the habitat and climatic changes that have occurred in this area in the last 50-75 years, e.g. the increase of human disturbances--egg and specimen collecting, boating, hiking, etc., biocide uses, when and where, habitat alteration--ranching to orchard uses;
4. to correlate all the above data in an attempt to find the cause(s) of the declines of these species.

If accurate conclusions can be drawn as to the cause(s) of the declines, two additional purposes can possibly be added:

5. to consider what measures could and should be taken to protect these species from extinction in this part of the Province;
6. to consider and attempt the re-introduction of these species into habitat once occupied by them.

Methods

To date, the major effort has centered around the first two aims. Field-work in the latter half of May and during two-day intervals (days off) in June and early July of 1966, has resulted in ten formerly used cliffs being checked. Correspondence and visits with more than thirty persons thought to have information pertinent to the study have yielded much data although in several instances no data were available or old data had been lost or destroyed.

The study area includes that part of B. C. south of a line from the vicinity of Cache Creek east to Sicamous. It includes the Okanagan Valley, the Shuswap Lake area, the valley of the Thompson River, and the Merritt-Nicola Lake region.

Results

The Peregrine was once a reasonably common bird in the Okanagan Valley. Some fifteen eyries were occupied in the Valley between Vernon and the international border in 1906 (letter from Major Allan

Brooks to Dr. J. Hickey, 1937). In the early part of this century the Prairie Falcon was occasionally seen in the south part of the Valley.

By 1930 or 1940 an almost complete reversal had occurred. The Prairies had become quite common, and the Peregrines had vanished from many of their previous haunts.

The tables below give a very general approximation of the histories of the falcon eyries in summary form. Data concerning the number of eyries checked and reported on are also given.

Table 1. Eyries visited or reported on for 1966, and totals of known eyries.

Eyries once used, cliffs checked or reported on, 1966 . . .	12
Eyries once used, cliffs not checked, and no 1966 information	<u>13</u>
Total known eyries in study area	25
Possible eyries--not positively of these species, not visited in 1966	4
Eyries found or reported occupied, 1966	2
	Possibly 3

Table 2. Summarized histories of eyries checked or reported on for 1966.

Peregrine eyries--apparently long occupied--unused in 1966	5
used in 1966 .	1?
Prairie eyries--apparently long occupied--unused in 1966 .	2
used in 1966 . .	1
Peregrine, then Prairie eyries--unused in 1966	2
used in 1966	1

Table 3. Dates of last known uses of eyries.

	<u>Prior to 1920</u>	<u>1920-45</u>	<u>1945-60</u>	<u>1960--Used in 1966</u>
Peregrine	2 (3)	or (3)	2	1 (?)
Prairie			1 1 (?)	2

Discussion

One of the most startling aspects of this study, to this writer at least, has been the considerable number of Peregrines which once inhabited this area. In the Okanagan Valley, for which records of various sorts have been kept since the beginning of this century, the main reduction in numbers of Peregrines seems to have occurred prior to the mid-1930's. Some seem to have survived in the northern part of the valley till somewhat later, some until the late 1950's, and possibly one is known to exist still. In mid-June of 1966, a pair was seen by E. Biglow in a relatively remote area in the center of the study area. He was unable to locate the exact eyrie site.

Two active Prairie Falcon eyries were found in northern parts of the study area in 1966. While active Prairie eyries, or even Peregrine eyries, may still exist in southern parts of the Okanagan, it is significant to note that none appear to be known--as far as my inquiries have reached, and as far as I have been able to check myself. The eyrie of Prairies found by this writer was in a fairly safe area (from the falcons' point of view), and the other one, located by E. Biglow, is similarly quite removed.

The reduction in numbers of Peregrines in other areas has been suggested to have resulted from a conflict with increasing numbers of Prairies, the conflict being almost directly for nesting sites on the cliffs. The results above suggest that few of the Peregrine sites have been "lost" to Prairies. The Prairies seem to have preferred a different type of cliff--and they appear to have conflicted only slightly for some food species. It is the belief of this writer that the increase in numbers of Prairies did not cause the reduction of Peregrines, but that it indicated a change occurring in the area, a change making life for Peregrines more difficult. With a reduction in Peregrines, the Prairies may have been allowed to move into more areas--or, more likely, the change made the area more suitable for Prairies and allowed their expansion northward up the Okanagan.

It is possible to explain parts of the declines of these two species by many means. The suspected factors at the start of this study were: 1. indiscriminate shooting; 2. scientific collecting of skin specimens and eggs; 3. removal of eyasses (young) by falconers; 4. widespread disease; 5. general interference by man as concerns roads, boats, hikers, etc.; 6. habitat alteration; 7. climatic change in the Pacific northwest or larger areas; 8. poisoning through the food chain from various biocides. These possible factors will be considered briefly.

Factors in the Decline. It must be admitted that losses of these birds during the nesting season may have been considerable due simply to indiscriminate shooting of "hawks" and "vermin." Such losses cannot be determined, but the widespread nature of these species' populations makes it highly unlikely that such shooting would have had a greatly decimating effect.

"Scientific" collecting of specimen skins and eggs earlier in this century is known to have accounted for many birds--actually as late as the early 1950's. I have data on some 28 Prairie skins taken in the study area since the beginning of this century, as well as some 11 Peregrine skins. I am attempting to gather as much information as possible about such specimens as they may indicate other once-used eyries, food species used, etc. While the number of birds removed in this way may have been great, it does not appear to have been great enough over the years to be entirely responsible for the declines. It may have had a fairly substantial significance in the early part of the Peregrine decline, although other information suggests other factors as being of primary importance.

Removal of eyasses by falconers in this area is considered as being entirely incidental to the declines to date. I know of only two eyasses taken in the area in this century. At most, maybe eight have been taken.

There is no indicative evidence suggesting disease as being a factor.

General interference by man admittedly has been responsible for part of the declines. These birds have indicated abilities to live close to man in certain areas, however, notably near Okanagan Falls (till the early 1950's), and at Cosen's Bay on Malamalka Lake (until about 1958), yet they have declined also in areas quite well removed from man's general travels.

The Okanagan Valley has passed through several phases in its agricultural history. In this century parts of the Valley have changed from ranching areas to orchard and farming areas. Changes in the flora and fauna of these areas have likely been considerable--but, again, these two falcon species were not entirely in such areas. This factor of habitat alteration seems to have had little significance in the over-all decline when considering the present evidence.

In recent years much evidence has been gathered suggesting that the western part of North America is gradually warming and becoming drier. Morlan W. Nelson, in a paper presented to the Peregrine Conference at Madison, Wisconsin in 1965, has put forth evidence indicating that such climatic changes are occurring and that they affect the reproductive success of the Peregrine. That such changes are reducing the likelihood of survival of Peregrine nestlings in southern parts or warmer parts first seems to agree with the picture seen to date in the Okanagan area. Certainly a great deal more information is needed before an order of importance can be attached to the above possible factors with any certainty at all.

One factor which appears to have an undeniable major significance in the last fifteen years of the decline is that of biocide influence on the birds of prey. In Britain there is little doubt now that biocides are of primary importance in the recent reduction of Peregrines there. The gradual decline in the Okanagan that has occurred in the earlier parts of this century suddenly increased in rate shortly after the Second World War. The correlation in time and space of the last uses of eyries suggests strongly that the

birds near to man, in the sense that they were near enough to take prey that may have become "loaded" with biocides from orchard sprays, etc., have disappeared first. It is also of significance to note that few of the above factors seem to have affected the Prairies--until the late 1940's. The increase in Prairies during the first half of the century suggests that the final decimating factor arose very suddenly. It is also of importance to note that the surviving Prairie eyries and the possible Peregrine eyrie are removed from what might be termed "biocide hazard areas."

It is unfortunate that the biocide hazard is year-long for these birds. During migration they might well be able to acquire doses sufficient to cause their eggs to be infertile or otherwise incapable of hatching, or even sufficient to kill the full-grown birds. A note of hope--some of the companies producing the myriad of biocides are presently attempting to produce biocides of very short-lived danger to wildlife.

Recommendations. It must be recommended that the Peregrines and Prairies in the B. C. southern interior be completely protected as far as possible. Removal of any adult birds, young falcons, or eggs (unless known to be addled) should be prohibited entirely. Such protection should include that area east of a line drawn 75 miles inland from the Pacific coast, and south of the 52nd parallel. At absolute minimum, such protection should be given to those falcons in the wild in the area covered by this study.

A second recommendation, for intensive study of these species in the areas just to the north of the present study area, might prove which factors are actually of prime importance in such a decline. Careful but detailed investigations into the distribution, numbers, behavior, and inter-relationships of these two species, as well as detailed recording of climatological factors (especially relative humidity) during the breeding seasons may show a decline actually occurring in the Peregrine numbers shortly in the future. Biocide analysis of eggs and prey would be useful as well. Study of the actual decline in progress might indicate what is necessary for the perpetuation of these species in the wild in these areas.

Further Work in This Study. I am continuing the gathering of as much information as possible about the Peregrines and Prairies in the study area. Much more data concerning the histories of the various eyries and the disturbances to which they were once subjected as well as of the reasons for their cessation of use are needed. Information on presently occupied eyries, their accessibility, the food items used, and the future of the surrounding areas are also important in the effort to protect those still in existence and to find just why the others have vanished. Any help in any of these aspects would be gratefully received.

In another year or so it is hoped that a far clearer picture will be available and that the observations and conclusions might be published with photographic and map evidence of the declines. No occupied eyries, or eyries of unknown status will be indicated on maps or in photographs because of the possible detrimental effects this might bring to them.

Summary

The decline of the Peregrine Falcon in the Okanagan Valley region of the southern interior of B. C. has followed two general stages. During the first thirty years of the twentieth century the relatively common Peregrine slowly became rarer, and the once relatively rare Prairie Falcon increased in abundance. Some Peregrines survived into the 1950's in the Valley, and some possibly still breed in remoter parts of the study area. A complex of factors is suggested as having some effect on the Peregrine decline--the factors of major significance are suspected to be climatic changes, and secondarily, specimen and egg collecting.

The second phase of the decline of these falcons seems to have begun in the early 1950's. It was during that decade and the present one that the few remaining Peregrine eyries as well as the relatively numerous Prairies' eyries suddenly became vacated. At present, this writer is unaware of any eyries used by these two species in the Okanagan in 1966. The factor responsible for this recent decline is almost certainly biocide contamination.

Two recommendations are presented: the Peregrine and Prairie Falcons should be given complete protection in the B. C. southern interior; careful and detailed investigations should be attempted in areas slightly to the north of the present study area in efforts to determine exactly what factors are causing the declines when the declines occur in these more removed areas.

It may be of importance also to note that the problems seen in these two falcon species are by no means confined to them alone. In the Okanagan, the Osprey and Bald Eagle were frequently seen birds earlier in this century. The Swainson's Hawk has apparently been reduced considerably in numbers in the last forty years. And the Burrowing Owl and the Sage Thrasher are close to extinction, if not extinct already, in the Okanagan.

Acknowledgements

I wish it were possible to mention all who have helped to date. Special note must be made of certain individuals who were especially helpful: Ed Biglow, R. M. Bond, J. Burbridge, Dr. I. McT. Cowan, J. Fowle, Dr. J. Hickey, P. F. Mackie, F. C. MacNaughton, P. Martin, Dr. D. A. Munro, M. Oswell, and R. W. Ritcey. F. L. Beebe has offered many suggestions of areas to search and many ideas to consider about raptor ecology. James Grant has provided much encouragement and considerable information in sightings of these species in the North Okanagan. Allan Brooks has allowed me special access to his father's diaries and their invaluable information on the first forty-five years of this century in the Okanagan.

Dr. M. T. Myres, J. A. Campbell, H. M. Webster, and Tom Ray have provided useful information on these falcons in areas outside B. C.

The following is a list of selected references indicating some sources of information on the topics discussed herein.

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Birds of Prey in the Collection of the
American Museum of Natural History

by

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The study collection of birds in The American Museum of Natural History, New York, numbers about one million specimens. Raptores are proportionately represented. The vast material gathered in South America under the supervision of F. M. Chapman, the wonderful collections from the East Indies amassed by Lord Rothschild, and the splendid African specimens obtained by the late James P. Chapin and others, are among the more important components of the New York collection. After purchase of the Rothschild Collection in the 30's our species representation of the Falconiformes and Strigiformes was perhaps 90 per cent complete. Then, over the past 10 years, we have made a special effort to acquire missing species of birds in general and raptores in particular. As a result of generous exchanges from other museums we now lack only one species in the entire order Falconiformes, and this a dubious one, namely Falco kryenborgi (see Stresemann and Amadon, Ibis, 1963, 105, pp. 400-402). Of the elusive owls we are not quite so well off, lacking six species; namely, Otus ireneae Ripley, recently described from East Africa; Otus beccarii of Biak Island, Papua; Mimizuku gurneyi of the Philippines; Bubo shelleyi of West Africa (of which we are promised, on its demise, an individual now in the New York Zoo); Scotopelia ussheri of West Africa, and Phodilus prigoginei, the African Bay Owl, still known from but one specimen.

This does not, of course, mean that some of the forms in our collection are adequately represented. Of Accipiter collaris, for example, we have only one, an immature; the Field Museum in Chicago, with its rich neotropical collections, happen to have 6 or 8 specimens of this bird.

The British Museum (Natural History) has the only other collection of birds, including raptores, at all comparable in size and completeness with that of The American Museum of Natural History.

I have not attempted to make an estimate of the total number of specimens of raptores in our collection. It would not mean much, since we have enormous series of some of the eastern migrants, shot by a flyway gunner of 50 years ago, who salved his conscience by having the birds he shot, or some hundreds of them, skinned out. Yet, it may give an indication of the size of the collection to indicate our approximate holdings of a few species:

Mississippi Kite	25 ±
Bald Eagle	50 ±
Prairie Falcon	35 ±

Of subspecies, of course, there are an appreciable number lacking, though we have most of them.

The justification for this or any other collection is the amount of use made of it. We always welcome visiting students of birds of prey, and can sometimes help with their expenses through the Frank M. Chapman Memorial Fund. Within reason, we are willing to identify specimens or to loan material to other institutions. The library of the museum contains most books and journal articles on birds of prey, except for items dealing solely with falconry. Even of the latter subject we have some outstanding items such as the great folio work by Schlegel and Wulverhorst. We also have two splendid paintings of gyrfalcons by Joseph Wolf, commissioned by D. G. Elliot for one of his monographs, and several field sketches and portraits of birds of prey by L. A. Fuertes and other artists.

Species represented by separate habitat groups in our Hall of North American Birds are the California Condor, Bald Eagle, Golden Eagle, Peregrine Falcon, and Great Horned Owl. Other habitat exhibits, though not restricted to single species, contain various birds of prey--e.g., an Andean Group featuring a South American Condor in flight.

American Museum of Natural History
New York, New York